

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 02-133570

(43)Date of publication of application : 22.05.1990

(51)Int.Cl.

C23C 14/34

H01B 12/06

H01L 39/24

(21)Application number : 63-284456

(71)Applicant : ANELVA CORP

(22)Date of filing : 10.11.1988

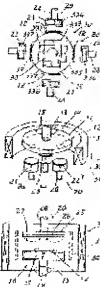
(72)Inventor : ASAMAKI TATSUO  
HOSOKAWA NAOKICHI  
KIN KIYOSHIOYUKU  
ISHIBASHI KEIJI

(54) SPUTTERING DEVICE FOR MULTIPLE BODY

(57)Abstract:

PURPOSE: To obtain the title sputtering device for a multiple body capable of obtaining a thin film having the composition almost equal to that of a target by providing a magnetic field so that the essential component of the magnetic field is made vertical to the surface of a substrate and uniformized at least in the vicinity of the substrate.

CONSTITUTION: When a BaYCu-based superconductor, for example, is sputtered, a target plate 21 consisting essentially of Ba or Ba oxide, a target plate 22 consisting essentially of Y or Y oxide, and a target plate 23 consisting essentially of Cu or Cu oxide are respectively fixed to a substrate holder 11. The substrate holder 11 is rotated in direction of the arrow 15, and a thin film is deposited on the surface of a substrate 12. At this time, a part of the target materials sputtered from the respective targets are charged. The charged bodies are focused in the space between the respective targets and the substrate 12 by the uniformized magnetic field resulting from the magnetic field generated by a coil 31 and the magnetic field in the same direction as that of the permanent magnets on the rear of the respective targets.



Accordingly, the charged body is mostly deposited on the substrate 12, and a thin film having the composition almost equal to that of the target is deposited on the substrate.

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-237639

(43)Date of publication of application : 08.09.1998

(51)Int.Cl.

C23C 14/34

C23C 14/06

H01L 21/203

H01L 21/285

(21)Application number : 09-055550

(71)Applicant : ANELVA CORP

(22)Date of filing : 24.02.1997

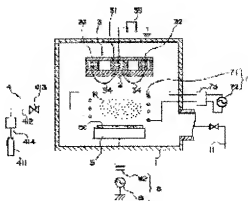
(72)Inventor : KOBAYASHI MASAHIKO

## (54) SPUTTERING DEVICE FOR FORMING BARRIER FILM FOR INTEGRATED CIRCUIT

## (57)Abstract:

PROBLEM TO BE SOLVED: To make it possible to sufficiently deposit barrier films for integrated circuits in holes of a high aspect ratio by excellent sputtering by devising the application of a technique of ionization sputtering.

SOLUTION: The titanium sputtered by a sputtering electrode 3 from a target 2 made of the titanium disposed in a sputtering chamber 1 having a discharge system 11 is ionized at the time of passing the inside of the induction coupling type plasma P formed by a high-frequency coil 71 constituting an ionizing means 7. The ions are attracted by the electric field perpendicular to a substrate 50 set by an electric field setting means 8 and are made incident on the substrate 50, by which the titanium thin films are deposited. The formed titanium thin films are subjected to a surface nitriding treatment by a nitrogen annealing means for supplying gaseous nitrogen to the substrate 50 while the substrate 50 is kept heated, by which the barrier films for the integrated circuits laminated with the titanium nitride on the titanium are obtd.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-209873

(43)Date of publication of application : 03.08.1999

(51)Int.Cl.

C23C 14/34

C23C 14/50

C23C 14/54

H01L 21/203

H01L 21/285

(21)Application number : 10-010634

(71)Applicant : APPLIED MATERIALS INC

(22)Date of filing : 22.01.1998

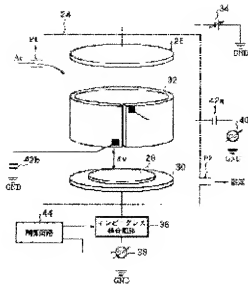
(72)Inventor : WADA YUICHI

## (54) SPUTTERING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a sputtering device for forming a thin film of high quality on a semiconductor wafer.

SOLUTION: The inside of a vacuum vessel 24 in which a sputtering gas is introduced is provided with a target 26, a holder part 30 confronting the target 26 and to be mounted with a semiconductor wafer 28 and a belt-like coil 32 for generating plasma on the space between the target 26 and the wafer 28. A high frequency oscillator 38 feeding high frequency electric power for a bias via an impedance matching circuit is provided. A control part 44 executes the feed forward control of the inside circuit constant of the impedance matching circuit 36 and the output electric power of the high frequency oscillator 38 for a bias based on the pressure of a sputtering gas, the d.c. electric power to the target 24, the high frequency electric power to the belt-like coil 32, the size of the semiconductor wafer 28 and the opening size of a contact hole.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2008-188647

(43)Date of publication of application : 21.08.2008

(51)Int.Cl.

*B21C 37/15 (2006.01)**F28F 1/12 (2006.01)**B21D 22/08 (2006.01)**B21D 31/00 (2006.01)**B21B 1/22 (2006.01)**B21D 53/04 (2006.01)*

(21)Application number : 2007-026791

(71)Applicant : CALSONIC KANSEI CORP

(22)Date of filing : 06.02.2007

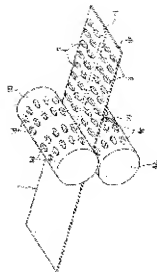
(72)Inventor : SAKAMOTO KAZUO  
HASHIMOTO HIROAKI

## (54) METHOD OF MANUFACTURING DIMPLED TUBE

## (57)Abstract:

PROBLEM TO BE SOLVED: To obtain a method of manufacturing a dimpled tube by which slip between a roller and a belt-like material is suppressed and the state of wear of the roller is easily determined only by the visual observation of the appearance of the manufactured tube.

SOLUTION: By forming knurled part 10 having a prescribed width on the whole circumference of the middle part in the axial direction of a projection roller 4A which is used in a dimple forming stage P1 and carving a knurled pattern 11 in the length direction of the surface 3f of the belt-like material 3 with the knurled part 10, the slip between the projection roller 4A and the belt-like material 3 is suppressed with the knurled part 10 and dimples 5 formed on the belt-like material 3 can be stably provided at pitches according to the original setting. Because the worn state of the projection roller 4A can be judged by the state of wear of the knurled pattern 11, the wear of the projection roller 4A can be checked without stopping a manufacturing equipment 1.



# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2007-112641

(43)Date of publication of application : 10.05.2007

(51)Int.Cl.

C04B 35/50 (2006.01)

H01L 21/3065 (2006.01)

(21)Application number : 2005-

303172

(71)Applicant : TOSHIBA

CERAMICS CO LTD

(22)Date of filing :

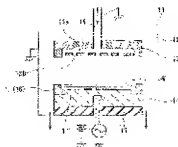
18.10.2005 (72)Inventor : HIRATA HIROYASU

(54) FOCUS RING

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a focus ring with resistance to high plasma density.

SOLUTION: This focus ring is produced by: adding an organic binder to the powder mixture of yttrium and aluminum to knead and mold; burning at a temperature of  $\leq 1,520^{\circ}\text{C}$  in a hydrogen or inert gas atmosphere so that an unreacted material  $\text{Y}_2\text{O}_3$  may be contained in a higher content than that of a reaction product  $\text{Al}_2\text{O}_3$  and also yttrium may be contained in the unreacted  $\text{Y}_2\text{O}_3$ .



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2008-115446

(43)Date of publication of application : 22.05.2008

(51)Int.Cl.

C23C 14/35 (2006.01)

C23C 14/34 (2006.01)

(21)Application number : 2006-301458

(71)Applicant : OSAKA VACUUM LTD

OGAWA SOICHI

(22)Date of filing : 07.11.2006

(72)Inventor : UEDA YOSHIHIKO

OGAWA SOICHI

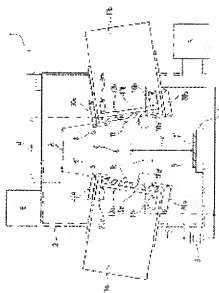
HARAGUCHI TAKAYUKI

## (54) SPUTTERING APPARATUS AND SPUTTERING METHOD

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a sputtering apparatus that increases a confinement effect for plasma and charged particles such as secondary electrons, which are formed between targets, into a space between the targets, without shortening distance between centers of a pair of the targets, and to provide a sputtering method.

SOLUTION: This sputtering method includes: generating an auxiliary magnetic field which has magnetic lines of force stretching along a magnetic field between the targets and in the same direction as that of magnetic lines of force in the magnetic field between the targets, at least in such a position as to block the space between the targets 10a and 10b and a substrate (B); and making the target sputtered.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2008-118015

(43)Date of publication of application : 22.05.2008

(51)Int.Cl.

H01L 21/3065 (2006.01)

(21)Application number : 2006-301386

(71)Applicant : TOSHIBA MATSUSHITA DISPLAY  
TECHNOLOGY CO LTD

(22)Date of filing : 07.11.2006

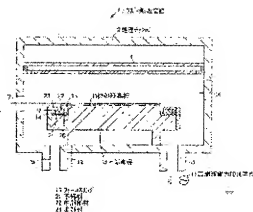
(72)Inventor : MACHIDA MINORU  
TOMIOKA TETSUYA

## (54) FOCUS RING AND PLASMA PROCESSING UNIT

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a focus ring by which in-plane uniformity of etching is improved and which is prevented from being scraped by etching.

SOLUTION: High frequency power which is applied to a lower electrode 3 is prevented from being transmitted around a substrate B to be treated by an intermediate member 22 which is positioned between a lower member 21 and an upper member 23. The etching rate around the substrate B to be treated is suppressed and the in-plane uniformity of etching can be improved. Also, scraping of the focus ring 15 by etching can be prevented.





## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2007-297699

(43)Date of publication of application : 15.11.2007

(51)Int.Cl.

C23C 14/32 (2006.01)

H05H 1/50 (2006.01)

(21)Application number : 2006-223213 (71)Applicant : OLYMPUS CORP

(22)Date of filing : 18.08.2006 (72)Inventor : ISOGAWA SEIJI

(30)Priority

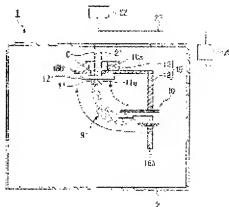
Priority number : 2006104009 Priority date : 05.04.2006 Priority country : JP

## (54) SURFACE TREATMENT DEVICE, OPTICAL ELEMENT FORMING DIE, AND OPTICAL ELEMENT

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a surface treatment device capable of uniformly treating a work by transporting generated plasma in an extensively distributed state with low concentration, and an optical element forming die subjected to the surface treatment thereby.

SOLUTION: The surface treatment device 1 comprises a vapor deposition source 10 having a vacuum chamber 2, a target connected to a trigger electrode via a cylindrical insulator, and an arc electrode for inducing the arc discharge around the target to emit plasma 8 generated by the arc discharge, a supporting stand 12 for loading a die base material 11 for forming an optical element, and a deflection unit 15 having a magnet 13 for deflecting plasma so that the advancing direction of plasma 8 emitted from the vapor deposition source 10 is the direction of the center axis C in a vicinity of the supporting stand 12. The magnet 13 is a polyhedron having a substantially rectangular peripheral section and integrally formed in a ring shape.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2006-299331

(43)Date of publication of application : 02.11.2006

(51)Int.Cl.

*C23C 16/505 (2006.01)**B65D 23/02 (2006.01)**C23C 16/27 (2006.01)**H05H 1/46 (2006.01)*

(21)Application number : 2005-121585

(71)Applicant : MITSUBISHI SHOJI PLAST KK

UTEC:KK

KIRIN BREWERY CO LTD

(22)Date of filing : 19.04.2005

(72)Inventor : TAKEMOTO YOSHIHIDE

KAGE TAKESHI

OIKAWA AKIHISA

TADA SHIGEKAZU

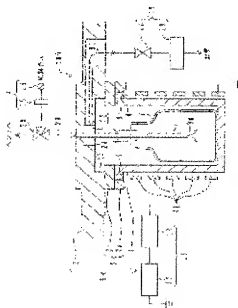
SAKAMOTO YUICHI

NAKATANI MASAKI

**(54) PLASMA CVD FILM DEPOSITION APPARATUS, AND METHOD OF MANUFACTURING PLASTIC CONTAINER HAVING GAS BARRIER PROPERTY****(57)Abstract:**

**PROBLEM TO BE SOLVED:** To provide a plasma CVD film deposition apparatus capable of performing the film deposition of the uniform film quality in the vertical direction of containers having different volumes without changing a chamber, and to provide a method of manufacturing a plastic container having the gas barrier property in which the film deposition of the uniform film quality is performed in the vertical direction of the containers having different volumes.

**SOLUTION:** The plasma CVD film deposition apparatus comprises a vacuum chamber to store a plastic container, a ribbon-shaped coil which is spirally coiled along a side wall of the vacuum chamber, a raw material



gas feed pipe which is attachably/detachably arranged inside the plastic container to feed the raw material gas into the plastic container, an exhaust means to exhaust the gas in the vacuum chamber, and a high frequency feed means to apply the high frequency power to the ribbon-shaped coil.

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2008-147703

(43)Date of publication of application : 26.06.2008

(51)Int.Cl.

H01F 41/18 (2006.01)

C23C 14/24 (2006.01)

C23C 14/34 (2006.01)

C23C 14/14 (2006.01)

C23C 14/56 (2006.01)

C23C 14/50 (2006.01)

(21)Application number : 2008-043092

(71)Applicant : CANON ANELVA CORP

(22)Date of filing : 25.02.2008

(72)Inventor : KOBAYASHI TSUKASA  
HIRATA KAZUO

(30)Priority

Priority number : 09131696 Priority date : 06.05.1997 Priority country : JP

## (54) MAGNETIC FIELD GENERATOR FOR SPUTTERING APPARATUS

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To generate two magnetic fields that intersect at right angles or at an arbitrary angle, in a fixed direction with high accuracy inside a large-area substrate, when forming a soft magnetic thin film by means of a sputtering device, while controlling the easy magnetization axis.

**SOLUTION:** A magnetic field generator generates magnetic fields, in parallel with the surface of a substrate having a relatively large area near the surface, when at least two magnetic films are formed in a laminated manner on the surface of the substrate with the easy magnetization axes intersecting at right angles or at an arbitrary angle by using a sputtering method. The magnetic field generator includes an annular magnetic yoke 21, arranged so as to surround the surface of the substrate, coil groups 2a, 2b, 3a, 3b,

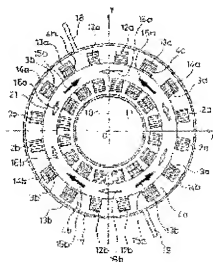


Fig. 1 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 2 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 3 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 4 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 5 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 6 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 7 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 8 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 9 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 10 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 11 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 12 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 13 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 14 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 15 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 16 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 17 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 18 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 19 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 20 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 21 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 22 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 23 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 24 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 25 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 26 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 27 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 28 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 29 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 30 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 31 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 32 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 33 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 34 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 35 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 36 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 37 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 38 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 39 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 40 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 41 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 42 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 43 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 44 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 45 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 46 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 47 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 48 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 49 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 50 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 51 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 52 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 53 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 54 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 55 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 56 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 57 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 58 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 59 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 60 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 61 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 62 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 63 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 64 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 65 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 66 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 67 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 68 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 69 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 70 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 71 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 72 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 73 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 74 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 75 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 76 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 77 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 78 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 79 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 80 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 81 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 82 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 83 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 84 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 85 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 86 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 87 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 88 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 89 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 90 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 91 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 92 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 93 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 94 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 95 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 96 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 97 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 98 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 99 is a schematic diagram of a magnetic field generator for a sputtering apparatus.  
Fig. 100 is a schematic diagram of a magnetic field generator for a sputtering apparatus.

4a and 4b comprising a plurality of coils wound around the magnetic yoke, for generating magnetic fields in the direction of a first easy magnetization axis; and coil groups 12a, 12b, 13a, 13b, 14a and 14b comprising a plurality of coils wound around the magnetic yoke, for generating magnetic fields in the direction of a second easy magnetization axis.

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2006-307243

(43)Date of publication of application : 09.11.2006

(51)Int.Cl.

C23C 14/35 (2006.01)

(21)Application number : 2005-127695

(71)Applicant : TSURU GAKUEN  
TOYO ADVANCED  
TECHNOLOGIES CO LTD

(22)Date of filing : 26.04.2005

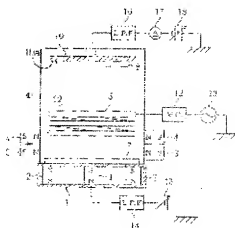
(72)Inventor : TAKESAKO HISAAKI  
MIYAMOTO TSUGUHISA  
KAWABATA TAKASHI  
NAKATANI TATSUYUKI  
OKAMOTO KEIJI  
KADOWAKI TOMOHARU

(54) MAGNETRON SPUTTERING FILM DEPOSITION SYSTEM WITH MULTIPLEX MAGNETIC POLES, AND FILM DEPOSITION METHOD THEREFOR

(57)Abstract:

PROBLEM TO BE SOLVED: To perform a film deposition by forming a plasma having high ion density in a wide range on the surface of a target, and moving the plasma having high ion density effectively.

SOLUTION: In the magnetron sputtering film deposition system with multiplex magnetic poles for forming a film on a substrate, a central magnet composed of either magnetic pole is disposed at the central part on the rear face of the target, a plurality of outer circumferential magnets composed of the other magnetic pole are disposed around the circumferential direction of the rear face in the target, first external magnets and second external magnets are disposed at the outside positions in the circumferential direction of the surface in the target, a coil is wound with the direction connecting the target and the substrate as an axis, high



frequency power is applied to the coil, electric power is applied to the space between the target and the substrate, and film material particles are released from the target, so as to form a film on the substrate.

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2007-258447

(43)Date of publication of application : 04.10.2007

(51)Int.Cl.

H01F 6/00 (2006.01)

C23C 14/35 (2006.01)

(21)Application number : 2006-080895

(71)Applicant : AISIN SEIKI CO LTD

(22)Date of filing : 23.03.2006

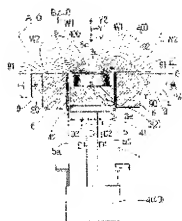
(72)Inventor : ITO YOSHITAKA

YANAGI YOSUKE

**(54) SUPERCONDUCTING MAGNETIC FIELD GENERATOR, AND SPUTTERING FILM FORMING APPARATUS****(57)Abstract:**

**PROBLEM TO BE SOLVED:** To provide a superconducting magnetic field generator advantageous to adjusting the distribution of a strong magnetic field from a superconductor, and to provide a sputtering film forming apparatus.

**SOLUTION:** The superconducting magnetic field generator 1 comprises a superconductor 3 emitting a magnetic field out below a superconducting transient temperature, a cooler 4 for cooling the superconductor 3, a heat-insulated container 5 for housing the superconductor 3, and a magnetic field control coil 9 for controlling the shape of a magnetic field distribution 400 emitted from the superconductor 3 energized with a current.





## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2007-277659

(43)Date of publication of application : 25.10.2007

(51)Int.Cl.

C23C 14/34 (2006.01)

G02B 5/28 (2006.01)

(21)Application number : 2006-107057

(71)Applicant : OPTORUN CO LTD

(22)Date of filing : 10.04.2006

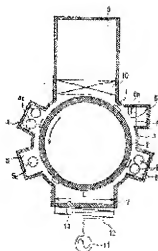
(72)Inventor : TAKAHASHI HARUO  
NAKAOKA ICHIJI  
MIKAMI YUSUKE

## (54) SPUTTER FILM DEPOSITION APPARATUS AND SPUTTER FILM DEPOSITION METHOD

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a sputter film deposition apparatus suitable for deposition of an optical film, and to provide a sputter film deposition method using the sputter film deposition apparatus.

SOLUTION: In the sputter film deposition apparatus, a substrate conveyor 2 is disposed in a vacuum chamber 3, and sputter regions 4, 5, 6 where ultrathin films made of bulk material are formed on a substrate 1 by rotary cylindrical magnetron sputtering, a reaction region 7 where the ultrathin film is converted to a desired compound ultrathin film by a reactive gas and an assist region 8 are disposed in a space between the substrate conveyor 2 and the vacuum chamber 3 outside the substrate conveyor 2. The reaction region 7 is provided with a plasma generation means which generates inductively coupled plasma of the reactive gas in the region, and the plasma generation means comprises a high frequency electric source 11 and a coil electrode 12 disposed wall of the vacuum chamber 3 and an inductive electromagnetic field introducing window 13 having a desired length in the circumferential direction of rotation of the substrate conveyor 2. Thus, the substrate 1 is conveyed from the sputter regions 4, 5, 6 to the assist region 8 and the reaction region 7, and the processes are



repeated to form the desired compound thin film on the substrate 1.

## PATENT ABSTRACTS OF JAPAN

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C23C 14/34 (2006.01)

(21)Application number : 2007-184880

(71)Applicant : ULVAC JAPAN LTD

(22)Date of filing : 13.07.2007

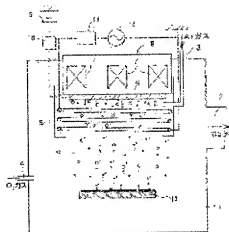
(72)Inventor : MORITA TADASHI  
MATSUURA MASAMICHI  
YAMAMOTO NAOSHI

## (54) SPUTTERING APPARATUS

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a sputtering apparatus which forms a compound insulator film convenient for a gap layer of a magnetic head and a tunnel junction type GMR at an extremely thin thickness of several tens to several hundreds  $\text{\AA}$ ; which are heretofore difficult with the conventional sputtering apparatus.

SOLUTION: A target 6 connected to a DC current 5 and a magnetron cathode 9 equipped with a magnet 7 behind the same and an RF coil 8 to enhance ionization efficiency in front of the same are disposed within a vacuum chamber 1 into which sputtering gas and reactive gas are respectively introduced. The target is connected to the DC current via an abnormal discharge prevention circuit.



## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2008-056990

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(71)Applicant : SHIN MEIWA IND CO LTD

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(72)Inventor : MARUNAKA MASAO

TSUCHIYA TAKAYUKI

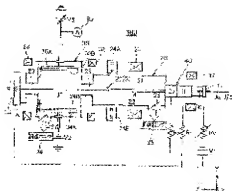
TERAKURA ATSUHIRO

## (54) SPUTTERING SYSTEM

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a sputtering system using sheet-shaped plasma by which the sputtering rate of a target can easily be controlled by means of a magnetic field.

SOLUTION: The sputtering system 100 comprises: a plasma gun 40 capable of releasing plasma 22 to a conveying direction; a formation chamber 20 having a conveyance space 21 elongating to the conveying direction; a pair of magnetic field generating means 24A, 24B sandwiching the conveyance space 21 in the formation chamber 20 to a direction crossed to the conveying direction, and in which the same poles are faced each other; a film deposition chamber 30 communicated with the conveyance space 21; a pair of electromagnetic coils sandwiching a target 35B arranged in the film deposition chamber 30 to the conveying direction and in which different poles are faced each other; and a power source V3. The plasma 22 spreads to a sheet shape by magnetic fields in a pair of the magnetic field generating means 24A, 24B, and current quantity in the target based on the incidence of charged particles in the sheet-shaped plasma 27 on the target 35B by bias voltage is controlled based on the coil magnetic fields by a pair of the electromagnetic coils 24A, 24B.



## PATENT ABSTRACTS OF JAPAN

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(51)Int.Cl.

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(21)Application number : 2006-056601

(71)Applicant : TOSOH CORP

(22)Date of filing : 02.03.2006

(72)Inventor : YAMAUCHI SHOICHI  
SHIBUTAMI TETSUO(54) SPUTTERING TARGET CONSISTING OF OXIDE SINTERED BODY, AND ITS  
MANUFACTURING METHOD

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a sputtering target consisting of an oxide sintered body such as ITO ( $\text{In}_2\text{O}_3\text{-SnO}_2$ ) which is capable of reducing generation of arcing and nodules and consistent in the quality of products.

SOLUTION: In the sputtering target consisting of an oxide sintered body such as ITO, the surface roughness ( $R_a$ ) on a sputtered surface of the target is  $\leq 0.1 \mu\text{m}$ , and the depth of an affected layer is  $\leq 1 \mu\text{m}$  when a section of the sputtered surface of the target is observed. The sputtered surface is ground by using a rotary surface grinding machine.